



PRIVATE AND CONFIDENTIAL

RESEARCH DEPARTMENT

**Visit to the first
International Congress on Reprography
Cologne, 1963**

REPORT No.A-080
1963/53

**THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION**

RESEARCH DEPARTMENT

**VISIT TO THE FIRST INTERNATIONAL CONGRESS ON REPROGRAPHY,
COLOGNE, 1963**

Report No. A-080

(1963/53)

T.N.J. Archard

A handwritten signature in dark ink, appearing to read 'T.N.J. Archard', with a long, sweeping horizontal line extending from the end of the name.

(T.N.J. Archard)

This Report is the property of the British Broadcasting Corporation and may not be reproduced or disclosed to a third party in any form without the written permission of the Corporation.

**VISIT TO THE FIRST INTERNATIONAL CONGRESS ON REPROGRAPHY,
COLOGNE, 1963**

Section	Title	Page
1.	INTRODUCTION	1
2.	DETAILS OF PROGRAMME	1
	2.1. General Application Techniques	1
	2.2. Principles and Mechanisms of Reprographic Processes	4
	2.3. Application Technical Problems	6
	2.4. Experience Gained in Practical Application	7
	2.5. Special Matters	8
3.	INDUSTRIAL EXHIBITION	8
4.	VISITS	9
5.	CONCLUSIONS	9
	APPENDIX	11

Report No. A-080

November 1963

(1963/53)

VISIT TO THE FIRST INTERNATIONAL CONGRESS ON REPROGRAPHY COLOGNE, 1963

1. INTRODUCTION

The First International Congress on Reprography was attended to ascertain the most recent developments in this science and to obtain at first hand, details of the latest equipment being manufactured to cover the various processes involved. The Course was of particular interest in being the first of its kind and attracted speakers from all over the world, with the U.S.A. and Germany (the acknowledged leaders in this field) being particularly well represented. In all, over 100 Papers were presented, but being the sole representative of the BBC, and as different lectures were given in two halls simultaneously, it was impossible to cover more than half the information given. A complete list of Papers read is given in Appendix A with those starred thus * being covered by the writer of this report.

2. DETAILS OF PROGRAMME

The programme was divided into the following categories:

- (i) General Application Techniques
- (ii) Principles and Mechanisms of Reprographic Processes
- (iii) Application Technical Problems
- (iv) Experience Gained in Practical Application
- (v) Special Matters

2.1. General Application Techniques

- (a) Microfilms

The ever increasing use of microrecording was much discussed and it became evident that there was in existence a number of different systems and formats. The principal types were:

- 70 mm film rolls
- 35 mm film rolls
- 16 mm film rolls
- 70 mm aperture cards
- 35 mm aperture cards

16 mm aperture cards

8 inch \times 5 inch (200 mm \times 125 mm) microjackets

5 inch \times 3 inch (125 mm \times 75 mm) microfische

5 inch \times 3 inch (125 mm \times 75 mm) microcards

Differences also existed as to the size of the image that should be printed in these areas and for the reduction ratios to be employed. After a number of Papers had been presented describing the virtues of these various sizes and the use of microfilm as an international tool for the dissemination of information, I went to the rostrum and made a plea for some further standardization. This matter was also discussed outside the Meeting with Mr. E.F. Patterson of the British Council of Micrography and Reproduction. He expressed considerable interest, and a further meeting with him is being arranged.

Mr. J.J. Bastardie of the Centre National de la Recherche Scientifique introduced a novel method of microrecording, using what he called 'waffled film'. This film had an integral multiple lenticular lens system and it was possible by altering the angle of incidence, to form as many as 25 separate images on a single surface.

Mr. T. Hampshire of U.K. A.E.A., who was one of four representatives from the British Civil Service Administration, gave a Paper on microfilming and the re-enlargement of engineering drawings. He made a point (which we in Research Department had already discovered) that it is rarely necessary to enlarge the microfilm back to its original size: a smaller enlargement is just as legible and usually more convenient to use. He discussed the Kalvar system of recording on microfilm. This

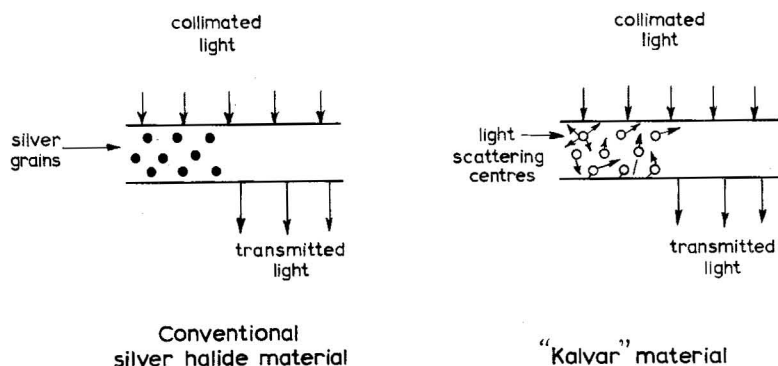


Fig. 1

is an all dry method of American origin, using a film base containing an imprisoned diazo salt. On exposure to ultra-violet light, nitrogen is released from the diazo material and forms into bubbles which expand with the application of heat and cause defraction and scattering of light rays through the film. Projection densities of more than 2.0 are said to be obtainable with a resolution of about 144 lines per millimeter.

Mr. R.G. Rudd's (U.S.A.) Paper on reprographic methods in colour, dealt with the resolution of colour materials. The facts given were, however, restricted to the products manufactured by Kodak Ltd. Kodachrome II film could now resolve up to 125

lines per millimeter, though the associated optics would probably reduce this figure to 70 - 90 lines per millimeter. This was a great improvement on earlier similar materials which were capable of only 40 - 50 lines per millimeter. In map reproduction it was essential to consider the smallest letter required to be faithfully reproduced. As a guide in microfilming the American Bureau of Standards recommended the use of the lower case 'e' letter in determining the maximum reduction ratio to be employed. From the examples shown it was evident that at least eight 'lines' were needed to give an excellent microfilmed image of this letter. If, therefore, on the original, the letter 'e' was only 1 mm high, it was necessary to restrict the maximum reduction to 10 : 1.

(b) New Materials and Processes

A new photo-sensitized coating was introduced by Mr. A. Harvey (U.S.A.). Paper coated with this substance could be printed using an ultra-violet source. The image required no development but it was evident, from the answers given, that the coating would, as expected, tend to fade in prolonged exposure to daylight, and its use was therefore somewhat restricted. A sample of the paper was obtained from Mr. Harvey.

A Paper by Dr. Carl Botkin (U.S.A.) on 'Electrofax', describes the greatly increased use being made of this system in North America. Slides were shown of a wide range of copying machines and it was evident that 'Electrofax' together with other allied electrostatic systems was becoming a serious competitor to the long established silver and diazo salts processes.

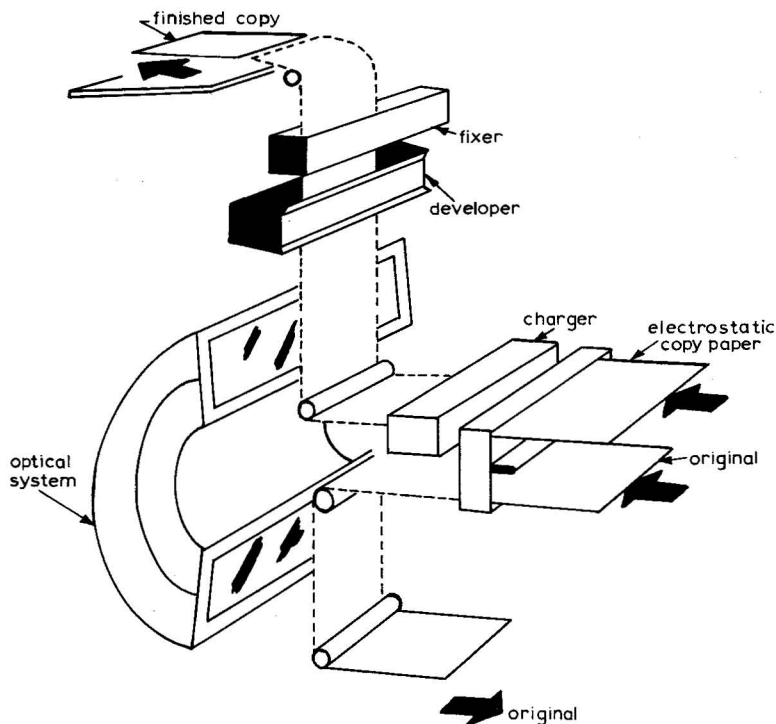


Fig. 2. Typical electrostatic continuous copying system

Mr. S. Ooba (Japan) did not appear in person to read his Paper on marking for ship-building by electro-photography, but sent a most interesting film describing the process. Large steel plates of about 10 ft square were coated with a photo-sensitized material (zinc oxide). This surface was charged by high voltage (some 8 Kv) and an exposure made through a film negative produced from previously prepared drawings. Development was by the now well-known cascaded toner system, and the resulting images were passed straight to the cutting table. Besides giving the correct shape to cut the plate, this method also conveyed instructions dealing with how and where it was to be fixed.

2.2. Principles and Mechanisms of Reprographic Processes

(a) Information, Theoretical Principles and Silver Salts Processes

These lectures were not attended as they coincided with those already described in paragraph 2.1.

(b) Electro-photographic Processes

It was evident from the large attendance at all meetings relating to these processes, that there was now great interest in this subject. However, the first three speakers, who were delegates from the U.S.S.R., did not appear, and consequently we did not obtain information on the progress of this particular science in the Soviet Union.

In the delegation from Japan, Mr. H. Kiwaki, Mr. S. Komeiji and Mr. M. Nakasone spoke of their experiments in producing reversal toner images. The process was as follows:

The photo-conductive zinc oxide layer after being negatively charged in the ordinary way and then exposed, is developed with a magnetic brush using semi-conductive toner particles; the layer is completely discharged by exposure and natural leakage. Then the layer which has the semi-conductive powder deposited on it is again charged in the dark by corona and a reversed latent image is obtained. This image is finally developed by another magnetic brush containing toner particles (this time not necessarily semi-conductive). The results which were displayed by means of slides, were not as yet up to high grade half-tone reproductions, but nevertheless showed considerable promise. Other Japanese contributors dealt with conditions which affect the image quality of electro-photography and reported on investigations into the properties of chemicals, other than zinc oxide, which were suitable as a medium for forming electrostatic images. Titanium dioxide was one of the substances that showed promise in this direction. My impression was that the Japanese were carrying out an intensive research into the principles of electro-photography before proceeding with the manufacture of equipment for its use.

Two British contributors, Dr. A.J.O. Axford and Mr. J. Gilbert discussed the characteristics of electro-photographic papers and described the process they used for obtaining their results. The equipment consisted of a drum rotated at a constant speed, to which the samples under investigation could be attached. Measurements were made of the decay time of the electrostatic charge under varying conditions. From the results obtained, the most suitable ratio of zinc oxide to resin coating could be deduced, and also the optimum charging voltage. Mr. A. Aldridge (Great Britain) also dealt with this problem from the paper maker's point of view, and said that at the

present time paper had to be specially made to suit the apparatus and system with which it was being used. There was not one general purpose grade.

A new method of image transference was outlined by Mr. E.F. Mayer (U.S.A.). Here the electrostatic image is taken from the forming plate or film by a transparent adhesive tape on to a 'donor film'. This transferred image can then be re-exposed and a further image produced with highly increased contrast. The process is called 'Stop-imaging'.

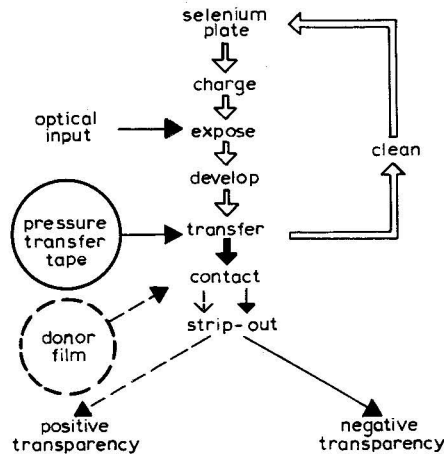


Fig. 3. "Stop imaging" sequence

Another system proposed by Mr. R.W. Gundlach (U.S.A.), was called 'Frost Imaging'. Here an analogy given was that of a frosted or steamed up car window in which a high-contrast image could be produced by writing with the finger. In practice an electrostatic image selectively de-forms the surface of a dielectric film. When the surface of the film is heat-softened the charged areas form microscopic depressions and ridges having light scattering properties similar to fine grain frost.

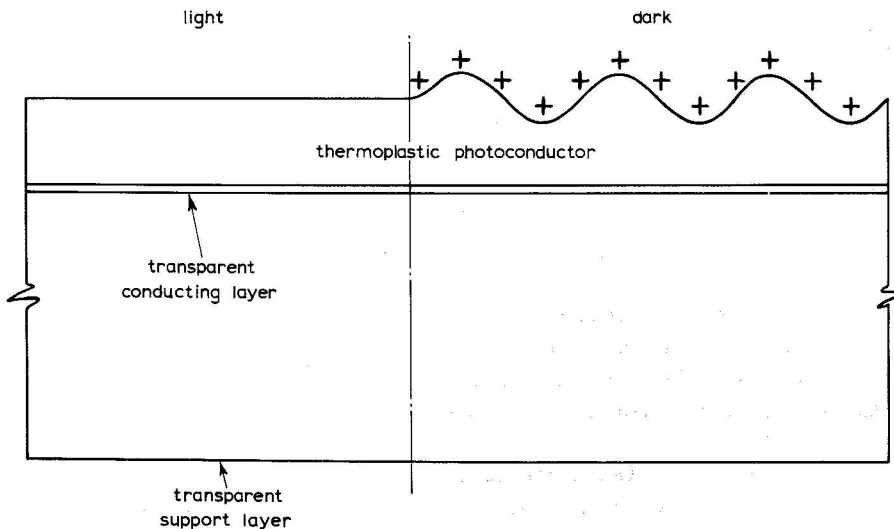


Fig. 4. Three - layer "frost" film

High resolution is claimed for this system and its ability to produce continuous tone images. The maximum density so far achieved however, is approximately one, and its use is at present limited to producing transparencies. The slides illustrating this lecture were produced by this method.

2.3. Application Technical Problems

Under this heading Mr. V.P. Barta (U.S.A.) discussed future methods of electronic printing. He outlined the development with which he was concerned at the Stanford Research Institute, California. This consisted of electrostatic printing through a fine screen in a somewhat similar method to photogravure except that the screen could be separated from the printing surface by as much as $\frac{1}{4}$ inch (6.3 mm); this made printing possible on irregular surfaces such as corrugated cardboard, bottles, etc. and from slides showing samples prepared by this scheme, the results were excellent.

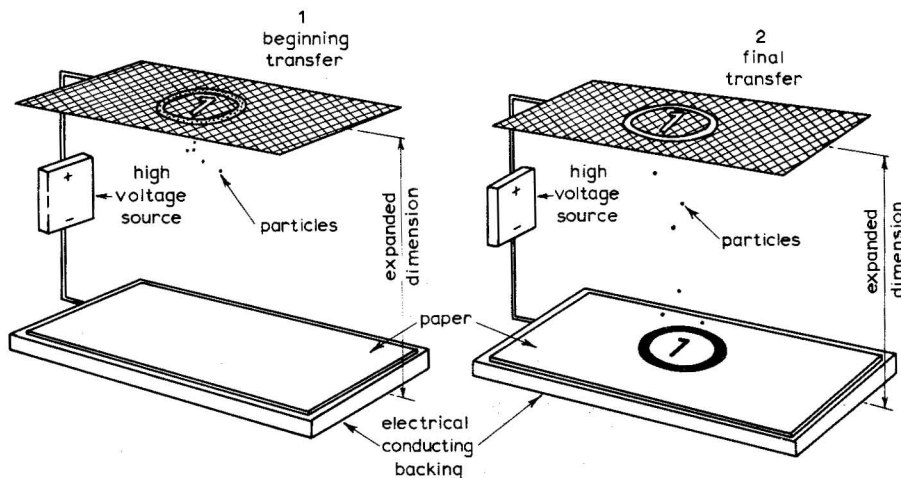


Fig. 5. Separated transfer of electrostatic images

Professor R. Pepinsky (U.S.A.) described a high-speed electrostatic printing system for a computer read-out. In this, every letter A in line 1 of a print out sheet would be produced first, followed by every letter A in line 2, while line 1 had each letter B printed, and so on. The letters were transferred by corona discharge actuated by pulses of $2 \mu s$ duration. Reading speeds of 1,000 lines per second were possible, but in practice were found to be too fast for normal use.

A lecture on reflex copying with diazo type papers was given in German by Dr. J. Kosar (U.S.A.). Unfortunately at this point the translation apparatus broke down and I was unable to follow his discourse. He has, however, promised to forward me a copy of the Paper on his return to U.S.A.

Dr. H. Von Rintelen (Germany) described the process by which it is possible to obtain a spirit master copy for hectographic (Banda type) duplicating directly from a transparent or opaque original. The original is first copied on to a special negative medium and this after development, is pressed in contact with a carbon paper.

When the carbon paper is removed, the image on the negative paper may be transferred on to a sheet of art paper to form the spirit duplicator master. Up to 500 copies from one master were said to be possible. This process is now commercially available in this Country. Another process which is also available here was described in the Paper by Mr. E.C. Yackel and colleagues (U.S.A.). This was an addition to the now familiar 'Verifax' system, which uses a dyed gelatine image and transfers it by pressure on to the copy paper. The change from the original system was the addition of a silver halide layer to which the dyed image is transferred by diffusion. The silver image could then be inked up and used for offset lithographic reproduction.

2.4. Experience Gained in Practical Application

It was unfortunate that Mr. Kyle and Mr. Barker (U.S.A.) who were to have read a Paper on self-service copying, did not appear, and as they had also failed to send a manuscript, this subject had to be omitted from the programme. To overcome this omission, I investigated apparatus of this type being displayed in the Industrial Exhibition and this is reviewed later in this report.

Dr. Kohte (Western Germany) dealt with storage and use of microfilming in the West German Federal archives. He spoke of the greater economy and facility of microfilm over the previously used photographic plates.

Madame Lucia Moholy (Switzerland) who had recently returned from Turkey, described the great benefits of microfilm in the field of international communications and its use to society in general. She is a lady of wide experience in this field, and being multilingual, it was thought that our Programme Service may be interested in this aspect of reprography, though I did not approach her on this matter.

Mr. J. Favorite (U.S.A.) dealt with applications of infra-red copying. This Paper suffered from blatant commercialism with all the pros and none of the cons being discussed. As is well known, the infra-red copying system is a very useful process, but has its limitations; one of them being its inability to copy in one stage from certain colours and types of ink.

The Photographic Department of the Centre National de la Recherche Scientifique was described in the second Paper read by Mr. J.J. Bastardie (France). His Department occupies three floors of the National Centre in Paris and is most lavishly equipped with all the latest devices and services, including a conveyor-belt system for document transportation. I asked if the speaker could give some idea of the cost of their reprographic services but his answer was evasive and he failed to quote any figures. However as many of their problems and services are similar to our own, it is felt that a visit to this Centre would be useful.

In the field of science, education and research, Dr. L.J. Van der Wolk, Prof. J. Mulders and Mr. J. Cauverien (Netherlands) described the use of microfische (125 mm x 75 mm microfilm negative) in library service, theology and medicine. Mr. J.J. Taks also of the Netherlands, dealt with the use of these microfische in teaching machines. It is of interest to note that the size of microrecord chosen by these workers is the same as that used by Research Department.

2.5. Special Matters

Training of staff to operate reprographic apparatus came under this heading and the matter was covered by Mr. H.R. Verry (Great Britain). Mr. Verry is a senior officer with the O. & M. Branch of H.M. Treasury. He disclosed that in Croydon the Civil Service have a training centre fitted with every kind of reprographic apparatus for the instruction of its personnel. He showed slides of this centre and it was exceedingly well equipped, much of the apparatus having been donated by industry. At the moment training at this centre is restricted to Government employees. In a second Paper which he read for Mr. G.H. Wright (Great Britain) of Hatfield Technical College, details were given of a similar centre there, and this is open for training industrial and office executives in the use of reprography and office systems applications.

Dr. J. Kosar (U.S.A.) read his second Paper which was on the use of pre-sensitized stabilene films for map reproduction. We are already aware of this technique and nothing new was disclosed.

3. INDUSTRIAL EXHIBITION

Advantage was taken of the invitation by the organizers of the Congress to visit the Industrial Exhibition of apparatus and equipment associated with reprography. This exhibition was international in character, the principal countries participating being France, Germany, Great Britain, Japan and U.S.A. In general I would say our Country's products were priced very favourably compared with others, but tended to lack the advanced stylization of the American or the robustness of the German equipment. For instance it was interesting to compare the German 'Rotaprint' machine with our own of the same name: the German version had, I thought, better placing of the controls, but was otherwise very similar. One exhibit which bears further investigation was a simple step and repeat photo-printer for making labels, name plates and legends in addition to its use as a caption device. The letters were produced from an interchangeable film matrix in a simple enlarger. The image was printed down on a pre-sensitized surface and then made visible by partial development. This enabled the next letter to be accurately positioned with relation to the previous one and by this method words could rapidly be built up. Final development and fixing was then completed and occupied a period of about 2 minutes. For name plates and labels a protective coating could be added. This company now has British agents for this equipment and a demonstration is to be arranged with them.

Many microfilm readers and reader-printers were on display; unfortunately, due to the factors outlined in 2.1.(a), no machine would cover all the sizes now in use. The Japanese were marketing a reader-printer for 16 mm and 35 mm roll film, which I think could be adapted for other formats. It was not yet available in the U.K. but they estimated that it would sell for about £100. This price was considerably less than other machines with similar facilities.

As the Department is shortly to obtain a new dyeline machine, particular note was made of the equipment in this field. The U.K. was again well represented and our machines were considerably cheaper than the German or American counterparts. Some of the American machines were truly magnificent with many de luxe features, but

they were very expensive. The German machines were comparable with our own, but did not have so many facilities for the same money.

The Caps-Jeffree (U.K.) enlarger was much in evidence on many stands apart from the manufacturers'. This apparatus uses an ultra-violet point light source and is capable of making excellent copies from Kalvar microfilm on to normal dyeline paper. It can also be used as a normal black-and-white enlarger and has an easy facility for adjustment of the enlargement ratio.

As mentioned in paragraph 2.4., the type of machine suitable for self-service copying was investigated. These machines which have a wide acceptance in the U.S.A. are now being installed in the U.K. There is one in existence at Paddington Station. The insertion of a 2/- piece in a coin slot automatically operates the machine and produces one single sided copy. The equipment works on a reflex system and gives two sizes of reproduction, working from either foolscap or quarto size documents. The machines are not usually sold by the makers but are installed in large buildings and offices rent free, with the owners taking a percentage of the money obtained.

4. VISITS

The invitation was accepted from the Directors of Farbenfabriken Bayer, A.G. to visit their works at Leverkusen where the Agfa photographic materials are manufactured. Unfortunately the visit was restricted to a tour of the plant by motor coach, driving over part of the 34 miles of internal roads and to the showing of a film covering their many products. In consequence no first hand information could be obtained in the many processes involved.

5. CONCLUSIONS

Attendance at this first Congress on Reprography resulted in a great deal of information being obtained on the many processes involved. The general tendency seemed to be to get away from what might be called the 'wet chemistry of photography' and to adopt all-dry systems. Of these, electro-photography appeared the more advanced and to offer the most promise for the future. Two methods of electro-photographic transfer were paramount.

The first, which is already well established in the U.K. uses the selenium drum or plate as a recording and transfer medium and prints out on ordinary paper. The second uses a coated (usually zinc oxide) print-out paper on which the electrostatic image is directly produced. The latter method is now capable of high resolution and is being developed for printing in colour.*

Microrecording was thoroughly investigated and discussed and an appeal was made for more standardization on size and reduction ratios to facilitate the interchange of information and to simplify the design of readers and reader-printers.

*The Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA) U.S. Army have already produced a four-colour continuous printer for map reproduction. It uses electrostatic print-out paper working directly from separation negatives recorded on 70 mm microfilm.

For users such as large industrial drawing offices, requiring constant reference and selection of microfiled information, the aperture card system coded for automatic sort-out would appear suitable. For the smaller user and libraries, the microfiche or microcard might well be more convenient. This method is very suitable for the recording of technical reports and memoranda as 30 to 50 pages can be copied on a single 5 inch x 3 inch (125 mm x 75 mm) fiche or card.

New methods of reprography such as frost or stop imaging were not considered to be sufficiently developed for their true potential to be assessed.

The Congress was well organized but attempted to do too much in the time allotted. It is hoped that this factor will be borne in mind when planning the next meeting in 1965.

APPENDIX

Detailed Programme of Papers

LARGE RHEINSAAL

Tuesday, October 15, 1963

PLENARY ADDRESS

*J. Eggert, Switzerland. Reprographische Verfahren unter Verwendung von Silberverbindungen

GENERAL APPLICATION TECHNIQUES, PART I

*Microfilm Jackets in Unitized Microfilm Systems: S. Engelstein, U.S.A.

*New Photo Sensitive Coating: A. Harvey, U.S.A.

Vom Mikrofilm zum automatischen Rollenausdruck: H.J. Knigge, Germany (did not appear)

GENERAL APPLICATION TECHNIQUES, PART II

*The (British) Council for Microphotography and Document Reproduction: E.F. Patterson, Great Britain.

*Reproduction - 'In-Plant' Evolution: E.G. Anderson, U.S.A.

*Reprographic Methods in Color: R.G. Rudd, U.S.A.

Schnellbearbeitung von Filmen mit viskosem Entwickler: K. Würstlin, Germany.

GENERAL APPLICATION TECHNIQUES, PART III

*Procédé photographique nouveau permettant le stockage et la recherche automatique de grandes quantités de documents: J.J. Bastardie, France.

*Information Storage and Retrieval with Microfilm: W.A. Cole, U.S.A.

*Fliessbandreproduktionen aus Mikrokopierrollen: D. Hofmaier, Germany.

*Zeichnungsarchivierung mit Mikrofilm und Maschinenlochkarten: H.E. Kamper, Germany.

GENERAL APPLICATION TECHNIQUES, PART IV

*Microfilming and the Re-enlargement of Engineering Drawings: T. Hampshire, Great Britain.

*Mikrofilm - der Einsatz von kombinierten Lese- und Rückvergrößerungsgeräten: J. Hensel, Switzerland.

*Reprographic Methods in Data Processing: R.H. Kay, U.S.A.

*Electrofax in the U.S.A. today: C. Botkin, U.S.A.

*Marking for Shipbuilding through Electrophotography: S. Ooba, Japan.

Wednesday, October 16, 1963

PLENARY ADDRESS

U. Schmiedel, Germany. Übersicht über den Stand der reprographischen Techniken.

APPLICATION-TECHNICAL PROBLEMS

Processes, Part I

New Methods of Processing by Web: L.W. Tregillus, U.S.A.

Conservation of Stabilized Prints: R.A.J. Baomal, Netherlands

Zur Fixierentwicklung von Dokumentenfilmen: H. Ulrich, Germany.

Processes, Part II

Future Methods of Electrostatic Printing: V.P. Barta, U.S.A.

On High-Speed Electrostatic Printing: R. Pepinsky, U.S.A.

*Reflex Copying with Diazotype Papers: J. Kosar, U.S.A.

*Neue Vervielfältigungsverfahren nach dem Silbersalzdifusionsprozess: H. v. Rintelen, Germany.

*New Direct and Indirect Off-set Printing Plates: E.C. Yackel, M.L. Scott, L.T. Connolly, U.S.A.

Duplicating Methods Using Photosensitive Materials: C.A. Horton, U.S.A.

Thursday, October 17, 1963

PLENARY ADDRESS

K. Hauffe, Germany. Reprographische Verfahren unter Verwendung von silberfreien Systemen mit Schwerpunkt der elektrophotographischen Verfahren.

EXPERIENCES GAINED IN PRACTICAL APPLICATION

Public Administration, Part I

Microfilm pour l'archivage et l'expédition des documents d'état civil: E. Correa-Aguirre, Uruguay.

Introducing Reprography in less developed Countries: E. Offenbacher, Israel.

Einige Fragen der Reprographie im Rahmen einer Verteidigungs-Dokumentation: R.H. Harbeck, Germany.

Public Administration, Part II

Die Anwendung des Mikrokopie-Planfilms in der Bevölkerungsverwaltung von Haarlem: H.H. Janssen, Netherlands.

Der Mikrofilm als Organisationsmittel in Industrie und Verwaltung: W. Scheffel, Germany.

Über die Kombination von bürotechnischen, Repro- und Druckverfahren bei der Herstellung listenartiger Arbeitsmittel: M. Helbig, Germany.

Über ein neues kombiniertes Aufnahme- und Fixierentwicklungs-Fließbildgerät: U. Welp, Germany.

Engineering Photographic Materials for Advanced Image Storage and Retrieval Systems: A. Kahn, U.S.A.

SPECIAL MATTERS

Authenticity, Falsification

Über den Beweiswert von photographischen Reproduktionen vom forensischen Standpunkt aus gesehen: L. Franzheim, Germany.

EXPERIENCES GAINED IN PRACTICAL APPLICATION

Economic Affairs, Part I

The Inter-relationship of Photographic and Reproduction Technologies used within Industries in the U.S.A. and the World: M.P. Myers, U.S.A.

Multikopien als Mittel der Rationalisierung bei Einkauf und Wareneingang: D.H. Joop, Germany.

Today's Microfilm is the Tool of the Future: W. Lacey, U.S.A.

Economic Affairs, Part II

Einsatz der Reprographie für masstäbliches Umzeichnen in der Kartographie: W. Stratmann, Germany.

Das Durchlaufverfahren zur Mikrofilmaufnahme von Zeichnungen und grossformatigen Unterlagen: W. Scheffel, Germany.

Microfiche or Microcard in Micro-Publishing - A Discussion: H.L. de Mink, Sweden.

Presse microfilmée: Reconstitution de collections complètes de journaux et de revues sur microfilm de long métrage: J. Prinnet, A. Tamas, France.

Friday, October 18, 1963

PLENARY ADDRESS

E.P. Taubes, U.S.A. Microfilm as a Systems Tool.

EXPERIENCES GAINED IN PRACTICAL APPLICATION

Education, Science and Research, Part I

*Die Reprographie als Faktor in der Gesellschaftsbildung: L. Moholy, Switzerland.

Self-Service Copying in Academic Libraries; Advantages to Libraries and to Library Users: D.L. Barker, R.J. Kyle, U.S.A. (Delegates did not appear)

*Anwendung der Reprographie im Archivwesen: W. Kohte, Germany.

Education, Science and Research, Part II

Erfahrungen und Richtlinien betreffend das Mikrokopieren in Deutschland, Österreich und der Schweiz: O. Schmidl, Switzerland.

Reprographie in den Archiven Israels: M. Shilo, Israel.

Etude comparée des divers procédés de microcopie pour la reproduction des thèses dactylographiées: P. Poindron, France.

*Microfilm and the Publication of Doctoral Dissertations: E.B. Power, U.S.A.

*La Microfiche 75 × 125 mm à images multiples (Reprographie de la Documentation en général): P. Deutsch, J. Voss, France.

*Versatility Applications for Infrared Copying: J.R. Favorite, U.S.A.

Education, Science and Research, Part III

*L'organisation actuelle du Service Photographique du Centre National de la Recherche Scientifique dans ce domaine: J.J. Bastardie, France.

*Microfiches for the Use of Research Workers: L.J. van der Wolk, Netherlands.

*Die Bedeutung der Mikrophotographie in der theologischen Wissenschaft: J. Mulders, Netherlands.

Die Anwendung der Planfilm-Mikrokopie in einem medizinischen Referatenblatt: J. Cauverien, Netherlands.

*Microfiche Data Storage in Teaching Machines: J.J. Taks, Netherlands.

*Reprography aids HERTIS in its Bibliographic Service to Education and Industry: G.H. Wright, Great Britain.

Das Titelaufnahmegerät, ein neues Hilfsmittel für Dokumentations- und Katalogabteilungen: F. AE. Koekebakker, Netherlands.

Dokumentation im Mittelformat, farbig: W. Faasch, Germany.

SMALL RHEINSAAL

Tuesday, October 15, 1963

PRINCIPLES AND MECHANISMS OF REPROGRAPHIC PROCESSES

Information-Theoretical Principles

Introductory Address: H. Frieser, Germany.

Etude de l'image photographique par analyse harmonique optique: R. Desprez, J. Pollet, France.

The Image Quality of Microfilms: H.J. Fromm, R.G. Rudd, U.S.A.

Anwendung der Übertragungstheorie auf die photographische Wiedergabe von Schriftzeichen: H. Frieser, K. Biedermann, Germany.

Silver Salt Processes, Part I

Introductory Address: E. Klein, Germany.

Der heutige Stand des Zweibadverfahrens: W. Berthold, Germany.

Einige Bemerkungen über die Fixierentwicklung von Dokumentenfilmen: G. Oosterloo, Germany.

Heavy Metal Salts and Organic Thio-Compounds in Photographic Stabilization Processing: K. Nasu, Japan.

Zur Haltbarkeit photographischer Bilder: M. Heilmann, Germany.

Haltbarkeit photographischer Schichten: N. Schmitz, Germany.

Silver Salt Processes, Part II

Untersuchung chemischer Vorgänge beim Silbersalzdifusionsverfahren: A. Radó, Hungary.

Difusionskinetik beim Silbersalzdifusionsverfahren: R. Meyer, Germany.

Die Bildbeeinflusser beim Silbersalzdifusionsverfahren: E. Brinckman, G. Van Veelen, Belgium.

Silver Salt Processes, Part III

Some Aspects of Infectious Development: G. Vanreusel, R. Verbrugghe, Belgium.

Erscheinungsformen von Umkehreffekten an Silberhalogenid-Schichten: F. Tomamichel, Switzerland.

Mechanismus einiger Umkehreffekte an Silberhalogenid-Schichten: F. Trautweiler, Switzerland.

APPLICATION-TECHNICAL PROBLEMS

Development of Apparatus

Neues Verfahren für die Reprographie: O.A. Guinau, Netherlands.

Anwendungstechnische Probleme in der Elektrophotographie: H.E. Müller, Germany.

Wednesday, October 16, 1963

SPECIAL MATTERS

Training Problems

*Multi-Color Map Reproduction with presensitized Stabilene Films: J. Kosar, C. Stein, F. Trusheim, U.S.A.

*Einfluss des Lichthofs bei den Negativ- und Positivmaterialien: T. Kisselbach, Germany.

*The proposed Training Schemes for Reprography in the U.K. (United Kingdom): H.R. Verry, Great Britain.

*Training Industrial and Office Executives in the Use of Reprographic Equipment for System Application: G.H. Wright, Great Britain.

The Growth of Microfilm in Italy: Technical and Juridical Features: E. Califano, Italy.

Urheberrechtsprobleme der Reprographie: P. Bobsin, Germany.

Thursday, October 17, 1963

PRINCIPLES AND MECHANISMS OF REPROGRAPHIC PROCESSES

Electrophotographic Processes, Part I

Introductory Address: P.M. Cassiers, Belgium.

Der gegenwertige Zustand der Elektrophotographie: V.M. Fridkin, I.V. Anfilow, U.S.S.R. (Delegates did not appear)

Elektrophotographie auf Kristallen aus Silberchlorid: V.I. Bugrienko, V.M. Fridkin, U.S.S.R. (Delegates did not appear)

Electrophotographic Processes, Part II

Einige Untersuchungen des Photoelektretzustandes in aktivierenden Alkalihalogenidkristallen: I.S. Abdulgamidow, I.S. Jeludew, V.M. Fridkin, U.S.S.R. (Delegates did not appear)

*The Mechanism of Optical Sensitization of Photoconduction of Zinc Oxide-Resin Layer: E. Inoue, Japan.

Untersuchung der spektralen Empfindlichkeit und deren Temperaturabhängigkeit von mit Farbstoffen sensibilisierten ZnO-Schichten: H. Frieser, M. Schlesinger, Germany.

Entladungsmechanismus und Gradation elektrophotographischer Schichten: R. Arneth, Germany.

Zum Mechanismus der Puderentwicklung in der Elektrophotographie: P.M. Cassiers, Belgium.

*Reversal Development of Continuous Tone Electrophotography by Magnetic Brush Method: H. Kiwaki, S. Komeiji, H. Nakasone, Japan.

Electrophotographic Processes, Part III

*Microfilm Sensitometry as related to Xerographic Reproduction: H.E. Clark, U.S.A.

*Some Conditions which affect the Image Quality of the Electrophotography: S. Kikuchi, T. Sakata, Japan.

*Characteristics of Electrophotographic Papers: A.J.O. Axford, J. Gilbert, Great Britain.

Electrophotographic Processes, Part IV

*Electrofax - the Paper Maker's Problem: A. Aldridge, Great Britain.

*On the Electrophotographic Properties of Titanium Dioxide Fax-Paper: H. Nozaki, Japan.

*Stop Imaging - A new Amplifying Xerographic Method: E.F. Mayer, U.S.A.

*Frost Imaging - A new Cyclic Xerographic Method: R.W. Gundlach, U.S.A.

Friday, October 18, 1963

PRINCIPLES AND MECHANISMS OF REPROGRAPHIC PROCESSES

Other Processes, Part I

Introductory Address: A.J.O. Axford, Great Britain.

Temperaturabhängigkeit der Lichtempfindlichkeit aromatischer Diazoverbindungen: R. Moraw, Germany.

Theory and Control of Light Scattering as applied in the Kalvar Process: R.T. Nieset, U.S.A.

Other Processes, Part II

Photopolymerisation of Acrylamide sensitized by AgX-Emulsions: G. Delzenne, Belgium.

Studies on Photosensitive Resins - A New Preparative Method of Polyvinyl Cinnamate and its Derivatives and Aspects of the Photosensitivity of the Dimerization-Type Resins: M. Tsuda, Japan.

Allgemeine Grundlagen von Wärmekopierprozessen: W. Lässig, Germany.

New Thermal Reproducing Process using the Nature of Super-Cooling: T. Kishida, M. Yoshioka, I. Fushiki, Japan.

Ein neues Reproduktionsverfahren mittels Metallkeim-Introduktion: C.J. Dippel, H. Jonker, Netherlands.

APPLICATION-TECHNICAL PROBLEMS

Lighting Technique and Optics

Introductory Address: O. Deile, Germany.

Moderne Lichtquellen in der Reprographie: W. Guckert, Germany.

Ultraviolett- und Infrarot-Strahlenquellen für die Reprographie: A.E.H. Meyer, Germany.

Application de la sélection chromatique dans l'analyse de la structure quantitative et qualitative de la matière: E. Calvet, Portugal.

Nouvelle technique de sélection chromatique par correction de la lumière: E. Calvet, Portugal.

BRI